

How do avalanches occur?

Explanation

Avalanches are swift movements of snow, ice or rock that come in many different shapes and sizes, from small slides of snow, to huge slabs that can travel up to 100 miles per hour. They can happen in any location that has certain features: a sloped surface, an enduring cover of snow with a weak layer and a trigger. Though they are beautiful to witness from afar, avalanches are a deadly element of Earth's physical geography.

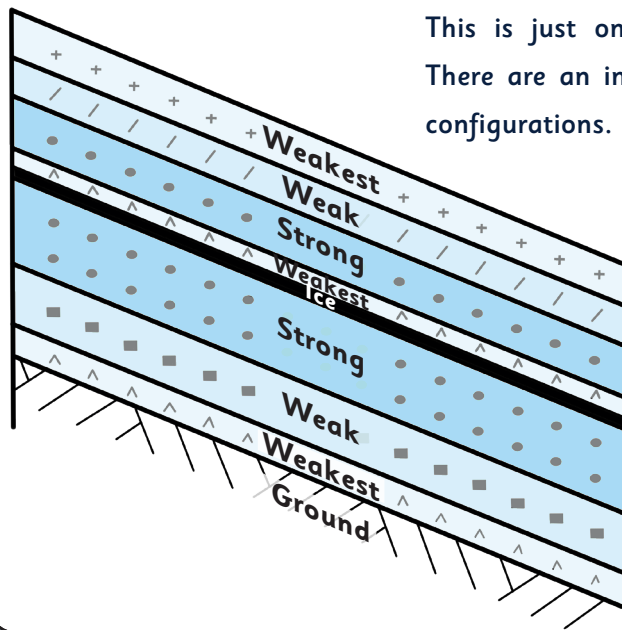
1. Firstly, snowpacks – long lasting systems of snow – accumulate in multiple layers during snowfalls. Over time, the snowpacks change in response to weather patterns; whilst certain weathers strengthen layers, others weaken them.

2. When a trigger occurs, it creates a fracture within a weak layer of the snowpack. Consequently, layers of snow begin to slide in the starting zone. The starting zone is the most unstable part of the slope, which is positioned higher on the mountain, where all avalanches launch from.

Did you know?

Although avalanches can start on a 30-degree incline, north-facing slopes of 35-50 degrees are most susceptible.

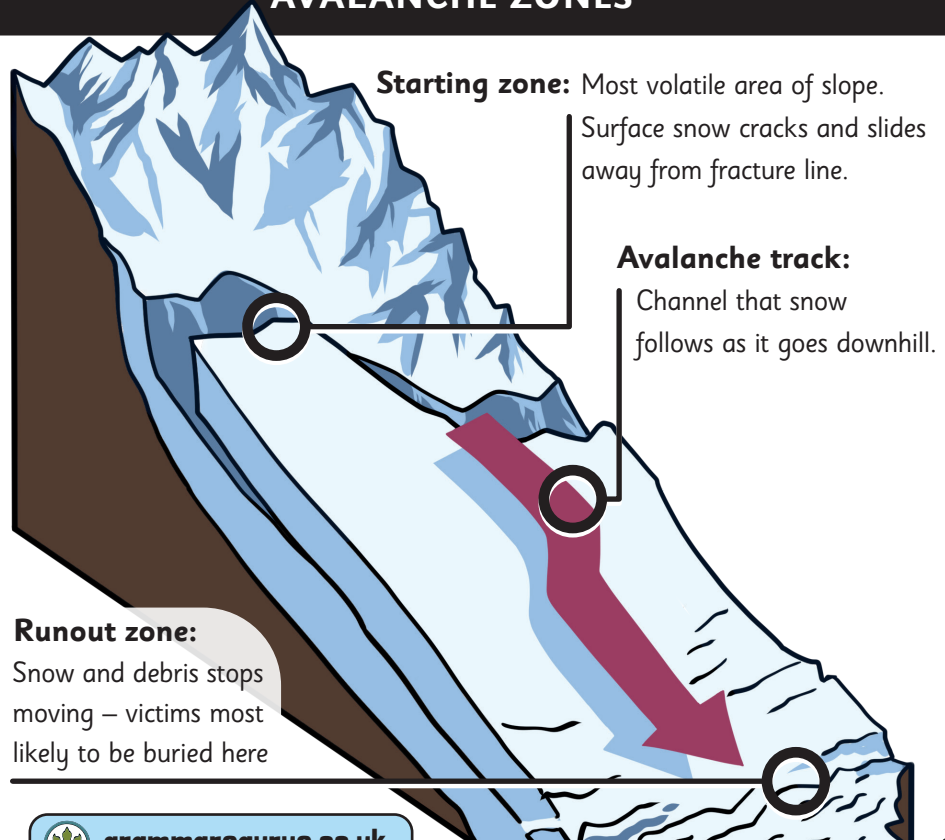
EXAMPLE OF LAYERS IN SNOWPACK:



This is just one possible configuration. There are an infinite number of possible configurations.

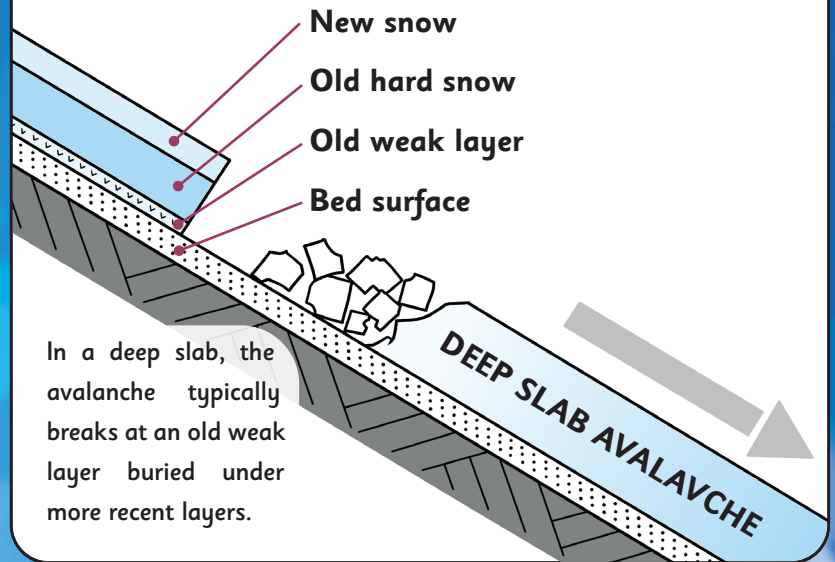
- new, soft snow
- partially melted snow
- older snow
- older snow on top of ice
- densely packed snow
- ice crystals
- ice crystals next to ground

AVALANCHE ZONES



3. If the weak layer of snow is on the top of the snowpack, this causes a sluff avalanche which is a small slide of loose, powdery snow. However, if the weak layer (also called the failure layer) is lower down, covered by layers of compressed snow, then much more dangerous slab avalanches can ensue. When a slab avalanche is triggered, the weak layer breaks off and travels down the slope, subsequently pulling the above layers with it. Since slab avalanches fall in giant blocks, they can cause terrible damage to anything in their path!

EXAMPLE OF LAYERS IN SNOWPACK:



4. Once the avalanche is triggered, it commences quickly. It is impossible to stop as it travels downhill at speeds of up to 100mph on its natural path: the avalanche track. Interestingly, Avalanches usually follow established paths of streams or rivers, pulling rocks, trees and ice with them. This creates a visible break in the vegetation which shows the avalanche's trajectory (called a trim line).

5. Eventually, the avalanche stops at the bottom, in the runout zone. When the snow stops here, it compacts like concrete. Therefore, avalanches are incredibly dangerous to humans – who usually cannot dig themselves out!

Did you know?

The human body is three times denser than avalanche debris. Thus, victims of avalanches sink very quickly!

What can trigger an avalanche?

Triggers are necessary to begin the avalanche process and there are a wide variety of triggers that can be separated into three key categories: natural, human and artificial.

What can trigger an avalanche?

- Avalanches are most likely to happen within 24 hours of a snowstorm that drops 12 or more inches of snow as the excess weight can cause weak layers of snow to break away.
- Extreme increases in temperature bring rain which consequently dissolves bonds between the snow grains.
- Natural movements, including earthquakes and animals' burrowing, can also disrupt fragile layers of snow.

Human triggers

- If the weight of a person is too great for a snow layer to withstand, it will collapse. For this reason, humans often create the trigger in most fatal avalanches.
- Disruptive vibrations from vehicles are also frequently responsible for snowpack failures.

Artificial triggers

Artificial triggers, such as explosives, are used by professionals to deliberately release small avalanches in controlled ways. This sensible approach helps avoid more destructive avalanches that place the public at risk.

